Claims

1. A method of producing a cladding tube for nuclear fuel for a nuclear boiling water reactor, which method comprises the following steps:

forming a tube which comprises an outer cylindrical component (10) mainly containing zirconium and an inner cylindrical component (20) metallurgically bonded to the outer component (10), wherein also the inner component (20) at least mainly contains zirconium, wherein the material compositions of the inner component (20) and the outer component (10) are selected such that they differ from each other and such that the inner component (20) has a lower recrystallization temperature than the outer component (10), characterised in that

after that the cladding tube has been formed according to the above and after possible rolling steps with there between occurring heat treatments, the cladding tube is final annealed at a temperature and during a time such that the inner component (20) substantially completely recrystallizes and such that the outer component (10) partly recrystallizes but to a lower extent than the inner component (20).

2. A method according to claim 1, wherein said final anneal is carried out such that the degree of recrystallization in the outer component (10) is higher than 50 %.

3. A method according to claim 2, wherein said final anneal is carried out such that the degree of recrystallization in the inner component (20) is substantially or completely 100 % and the degree of recrystallization in the outer component (10) is between 50 % and 96 %.

4. A method according to any of the preceding claims, wherein the inner component (20) does not contain more than 1500 ppm Fe.

5. A method according to any of the preceding claims, wherein the inner component (20) does not contain more than 1000 ppm O.

6. A method according to any of the preceding claims, wherein the outer component (10) has a composition which is completely or substantially according to Zircaloy 2 or Zircaloy 4.

7. A method according to any of the preceding claims, wherein the inner component (20) contains between 0.1 and 0.7 percentage by weight Sn.

8. A method according to claim 7, wherein the inner component (20) contains 0.1 to 0.4 percentage by weight Sn, 400 to 1500 ppm Fe, less than 600 ppm O and the rest Zr, except for impurities of a content that does not exceed that which is normally accepted in Zr or Zr-alloys for applications in nuclear reactors.

9. A method according to any of the preceding claims, wherein the inner component (20) has a thickness such that it constitutes between 3 % and 30 % of the total thickness of the cladding tube.

10. A method according to any of the preceding claims, wherein the final anneal is carried out at a temperature of between 485°C and 550°C.

11. A method according to any of the preceding claims, wherein the final anneal is carried out during 1h to 6h.

12. Use of a cladding tube produced according to the method according to any of the preceding claims in a fuel assembly for a nuclear boiling water reactor.

13. A cladding tube for nuclear fuel for a nuclear boiling water reactor, which cladding tube comprises:

an outer cylindrical component (10) mainly containing zirconium,

an inner cylindrical component (20) which at least mainly contains zirconium and which is metallurgically bonded to the outer component (10), wherein the material compositions of the inner component (20) and the outer component (10) differ from each other and are such that the inner component (20) has a lower recrystallization temperature than the outer component (10), characterised in that

the inner component (20) has a substantially completely recrystallized structure and the outer component (10) has a structure such that it is partly recrystallized but to the same extent as the inner component (20).

14. A cladding tube according to claim 13, wherein the degree of recrystallization in the outer component (10) is higher than 50 %

15. A cladding tube according to claim 14, wherein the degree of recrystallization in the inner component (20) is substantially or completely 100 % and the degree of recrystallization in the outer component (10) is between 50 % and 96 %

16. A cladding tube according to any of the claims 13-15, wherein the inner component (20) does not contain more than 1500 ppm Fe.

17. A cladding tube according to any of the claims 13-16, wherein the inner component (20) does not contain more than 1000 ppm O.

18. A cladding tube according to any of the claims 13-17, wherein the outer component (20) has a composition which is completely or substantially according to Zircaloy 2 or Zircaloy 4.

19. A cladding tube according to any of the claims 13-18, wherein the inner component (20) contains between 0.1 and 0.7 percentage by weight Sn.

20. A cladding tube according to claim 19, wherein the inner component (20) contains 0.1 to 0.4 percentage by weight Sn, 400 to 1500 ppm Fe, less than 600 ppm O and the rest Zr, except for im-

purities of a content that does not exceed that which is normally accepted in Zr or Zr-alloys for applications in nuclear reactors.

21. A cladding tube according to any of the claims 13-20, wherein the inner component (20) has a thickness such that it constitutes between 3 % and 30 % of the total thickness of the cladding tube.

22. A fuel assembly for a nuclear boiling water reactor, comprising:

an enclosing tube (2), and

a plurality of cladding tubes according to any of the claims 13-21 filled with nuclear fuel suitable for such cladding tubes for a boiling water reactor, wherein said plurality of cladding tubes are arranged inside said enclosing tube (2).